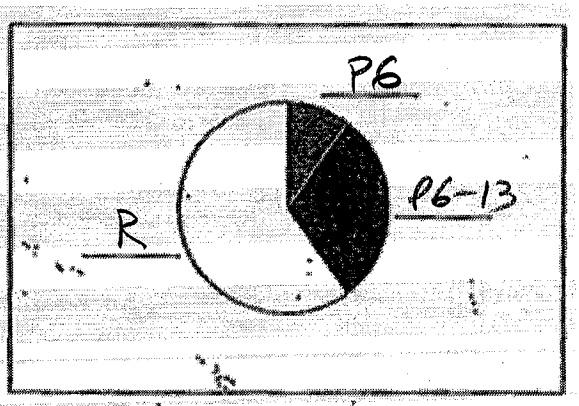
AP Statistics Ch 3 - Required Practice **Name:** Solutions **Per:** ____

Below is some information about films for the "Best Movie" Academy Award (Oscar) in 2009.

Name	Genre	Budget (millions of dollars)	Total # of Oscar Nominations	Running time (minutes)	MMPA Rating
Avatar	Adventure	237	9	162	PG-13
The Blind Side	Drama	29	2	128	PG-13
District 9	Action	30	4	112	R
An Education	Drama	7	3	95	PG-13
The Hurt Locker	Action	11	9	131	R
Inglourious Basterds	Drama	70	8	153	R
Precious	Drama	10	6	110	R
A Serious Man	Comedy	7	2	106	R
Up	Animated	175	5	96	PG
Up in The Air	Comedy	30	6	109	R

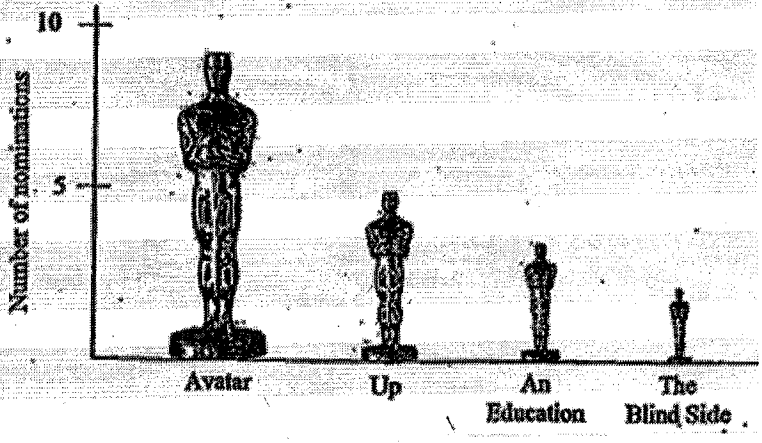
#1. **Identify the variables that were recorded, and indicate whether each one is categorical or quantitative.** Genre (categorical) Budget (quantitative) MMPA rating (categorical) #oscars (quantitative) running time (quantitative)

#2. **Here is a pie chart for the distribution of the variable "MMPA rating." Fill in the blanks with the appropriate values of the variable.**



#3. **Below is a graph showing the total number of Oscar nominations for the four films that had PG or PG-13 ratings. What's wrong with the way the information is presented in this graph?**

This bar graph violates the area principle



Researchers looking at the relationship between the type of college attended (public or private) and achievement gather the following data on 3265 people who graduated from college in the same year. The variable "management level" describes their job description 20 years after graduating from college.

		Type of College: Public	Private	
Management level	High	75	107	182
	Medium	962	794	1756
	Low	732	595	1327
		1769	1496	3265

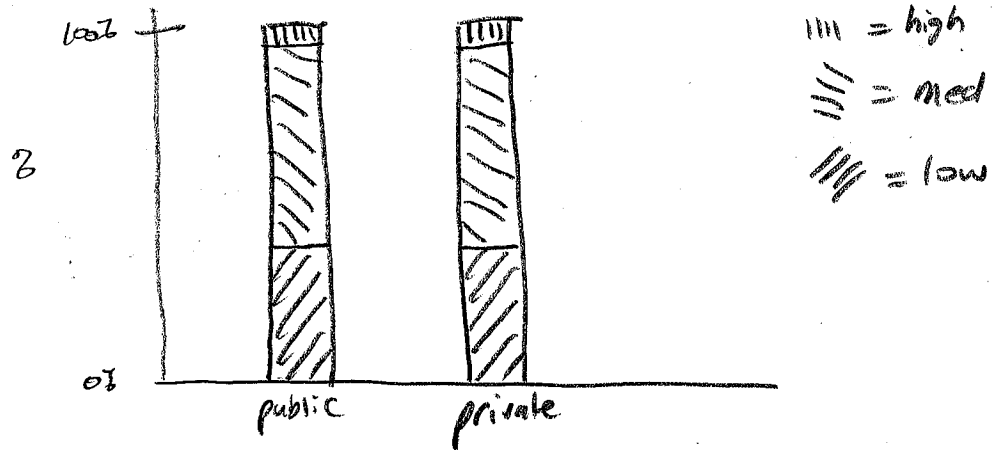
#4. Write the marginal distribution of type of college (in counts and in percents).

Public	Private	
1769	1496	/3265
(54%)	(46%)	

#5. Write the conditional distribution of management level for each college type (in counts and in percents).

	High	Medium	Low	
for public:	75 (4%)	962 (54%)	732 (41%)	/1769
for private:	107 (7%)	794 (53%)	595 (40%)	/1496

#6. Sketch side-by-side segmented bar graphs for the two conditional distributions in #5.



#7. Write a few sentences summarizing what the segmented bar graphs reveal about the association between management level and type of college.

The percentage for each management level is very similar between public and private colleges:
- High mgmt level: 4% public vs 7% private
- Medium mgmt level: 54% public vs. 53% private
- Low mgmt level: 41% public vs. 40% private

The differences between public & private are 3% or less. This suggests that management level is independent of type of college.

#8. Popular magazines often rank cities in terms of how desirable it is to live and work there. Identify two categorical variables and two quantitative variables that could be used to measure a city's characteristics. Give a reason for each of your choices.

Examples of possible answers:

Categorical

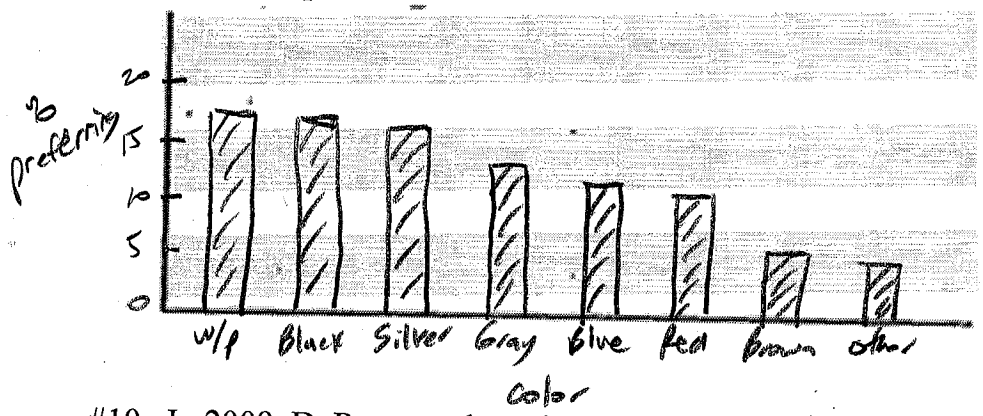
- Job Growth ('fast', 'average', 'slow')
- Night Life ('dull', 'average', 'hot')

Numerical

- Number of parks per square mile
- Job Growth (something like rate of new jobs as percentage of local job market)

#9. Each year, the DuPont Corporation publishes the results of a poll of car-color preferences for North American drivers. Here is the distribution of color preference for 2009:

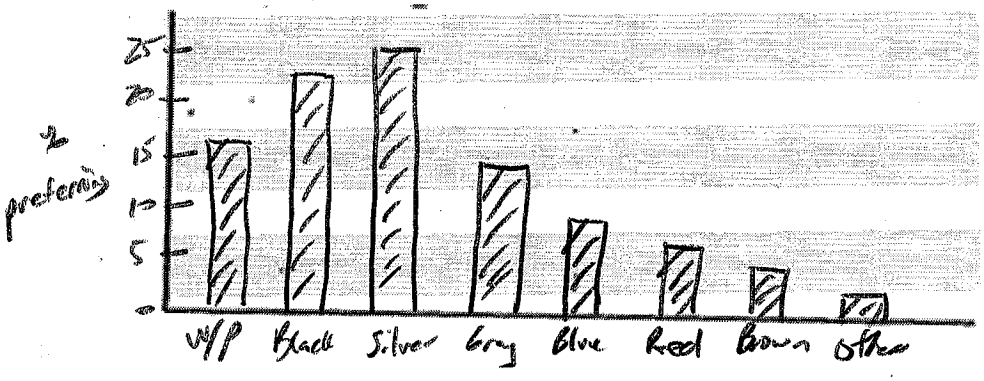
Make a bar graph of these data.



Color	Percentage
White/Pearl	17.8
Black	17
Silver	16.7
Gray	13
Blue	12.4
Red	12
Brown	5.7
Other	5.4

#10. In 2009, DuPont conducted a similar poll worldwide. Here is the distribution for global car color preferences:

Make a bar graph of these data.



Color	Percentage
White/Pearl	16
Black	23
Silver	25
Gray	13
Blue	9
Red	8
Brown	4
Other	2

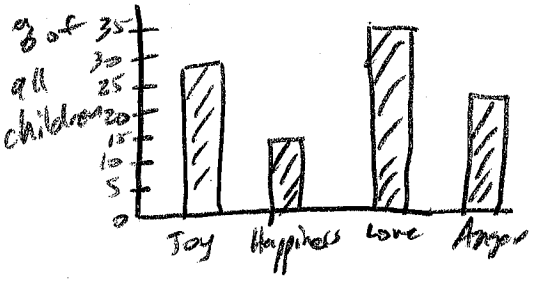
#11. Comment on the most important differences between these two distributions.

The most popular color in North America is white/pearl (17.8%) but it is silver globally (16%). Black cars are more popular globally (23%) than in North America (17%).

A research study asked children which of four different emotions they associated with the color red. The response and gender of each child are given in the following table.

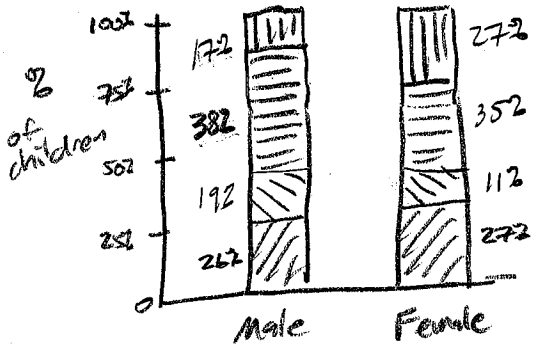
	Joy	Happiness	Love	Anger	
Male	28	20	40	18	106 (32%)
Female	61	25	80	60	226 (68%)
	89 (27%)	45 (14%)	120 (36%)	78 (23%)	332

#12. Use the data in this table to discuss the relationship between the emotions children associate with the color red and gender. Use the techniques and language you have learned in this section to support your conclusions. (You must use percentages and segmented bar graphs as part of your analysis, and finish with a paragraph stating something about the association).



Overall, children associate red with love the most (36%) and happiness the least (14%).

	Joy	Happiness	Love	Anger	
Males:	28 (26%)	20 (19%)	40 (38%)	18 (17%)	/106
Females:	61 (27%)	25 (11%)	80 (35%)	60 (27%)	/226



|||| = Anger
≡ = Love
\\\ = Happiness
/// = Joy

← You must create a segmented bar graph to comment on association.

The percentages for each word are fairly similar for males and females, although more females associate red with anger (27% vs. 17% for males) and more males associate red with happiness (19% vs. 11% for females). None of these differences are larger than 10% which suggests that there is no association between emotion choice for red and gender (they are independent).

Chapter 3 Practice Quiz

Has the percentage of young girls drinking milk changed over time? The following table is consistent with the results from "Beverage Choices of Young Females: Changes and Impact on Nutrient Intakes" (Shanthy A. Bowman, *Journal of the American Dietetic Association*, *102*(9), pp. 1234-1239):

		Nationwide Food Survey Years			
		1987-1988	1989-1991	1994-1996	**Total**
Drinks Fluid Milk	Yes	354	502	366	**1222**
	No	226	335	366	**927**
	Total	**580**	**837**	**732**	**2149**

← show how things are computed

1. Find the following:
   a. What percent of the young girls reported that they drink milk? $\frac{1222}{2149}$ = 57%
   b. What percent of the young girls were in the 1989-1991 survey? $\frac{837}{2149}$ = 39%
   c. What percent of the young girls who reported that they drink milk were in the 1989-1991 survey? $\frac{502}{1222}$ = 41%
   d. What percent of the young girls in 1989-1991 reported that they drink milk? $\frac{502}{837}$ = 60%

2. What is the marginal distribution of milk consumption?

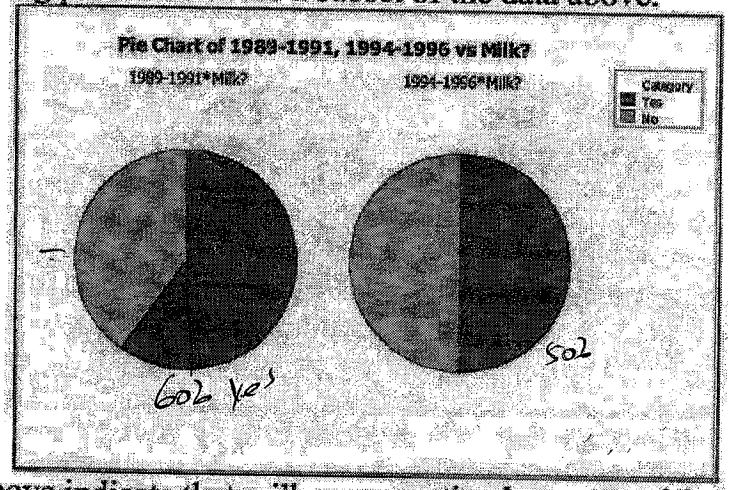
   Yes: 1222 (57%) No: 927 (43%) / 2149

3. Do you think that milk consumption by young girls is independent of the nationwide survey year? Use statistics to justify your reasoning.

	Yes	No
87-88	354/580 = 61%	226/580 = 39%
89-91	502/837 = 60%	335/837 = 40%
94-96	366/732 = 50%	366/732 = 50%

Although the % of girls drinking milk is lower in 1994-1996 (50% compared to 60% & 61%) this difference is <15% so this suggests girls drinking milk is independent of year.

4. Consider the following pie charts of the a subset of the data above:



Do the pie charts above indicate that milk consumption by young girls is independent of the nationwide survey year? Explain.

The pie chart makes the difference look large, but it still only a 10% difference (Rule of thumb is ~15% difference is when start considering things 'significantly different')
Answer is still drinking milk is independent of year.